THE SECRETORY NERVES.—Communication by M. Vulpian to the Acad. des Sciences, Sept. 9 (rep. in *Bull. Gén. de Thérapeutique*).

I remarked at a late *séance* the following fact observed by Luchsinger: that if we divide the sciatic nerves in a cat, the chloro-hydrate of pilocarpine, injected under the skin on the same day as the section, causes an abundant secretion of sweat on the digital pulps of the corresponding members as well as in the other limbs; but if the section has been made more than six days, the injection of the pilocarpine has no sudorific effect on the digits of the corresponding foot.

Is the case the same with the sub-maxillary salivary gland, the excito-secretory nerves of which are well known, and on which jaborandi and its alkaloid, pilocarpine, act as on the sudoriparous glands? This is the question to the investigation of which I applied myself. My experiments were performed on dogs.

Researches, under my direction, by MM. Carville and Bochefontaine, have demonstrated that jaborandi still excites the secretion of the sub-maxillary gland of the dog, when we inject the infusion of this plant into a vein, the dog on which the operation either of dividing the chorda tympani, or of the cervical sympathetic, or after excitation of the superior cervical ganglion, or even after in the same dog, we have removed the cervical ganglion and cut the lingual nerve joined to the chorda tympani.

On April 26, I examined the action of jaborandi on a dog that had undergone on the 19th, that is, seven days previously, the section of the lingual nerve of the right side, above the point where the chorda tympani leaves it to enter the sub-maxillary gland. As in all the other experiments which I describe in this communication, the investigation of the action of jaborandi was performed on a curarized animal undergoing artificial respiration. A metallic tube was fixed in each of Wharton's ducts. A small amount of rather strong infusion of jaborandi was injected into one of the saphenous veins towards the heart.

In the dog in question we found that the intra-venous injection of infusion of jaborandi caused almost immediately an abundant flow of saliva from Wharton's duct of the left side (*lingual intact*); on the right there was also a flow, but less abundant and appearing a little later on the left, and the saliva was more viscous and stringy on the right than on the left. When the excito-salivary action of the jaborandi was exhausted, a new injection was made, and again the same difference in the secretion of the two sides was observed.

Jaborandi, therefore, produces its ordinary effect on the sub-maxillary salivary gland seven days after the division of the chorda tympani; this action is only slightly enfeebled and the characters of the produced secretion are a little modified.

But the chorda tympani is not the only excito-secretory nerve of the sub-maxillary gland. The nerve fibres of the great sympathetic sent to that gland, contain, without doubt, freno-secretory fibres, but they are especially made up of excito-secretory fibres, as all experiments demonstrate.

To compare the effects produced, after several days, on the sub-maxillary gland, by section of the chorda tympani, and those caused, under the same conditions by the section of the glandular fibres from the sympathetic, it is needful to divide the cervical sympathetic or, better, to excise the superior cervical ganglion. This last operation was performed on a dog, on the right side, on July 21, and the action of jaborandi was examined on the 31st of July, that is, ten days after the operation. The two lingual nerves were cut transversely above the point where the secretory filament from the chorda tympani detaches itself; then we faradized successively the peripheral ends of these divided nerves at the point where they still contained the whole of the chorda tympani, and found that the secretion of saliva was more free on the left than on the right side (where the sympathetic ganglion had been excised). This result was repeated a number of times; we injected into the saphenous vein some centimetres of infusion of jaborandi: the saliva flowed almost simultaneously from the two Wharton's ducts; the quantity was rather greater on the right side than on the left

We see, therefore, that jaborandi still exerts its excito-secretory action on the sub-maxillary gland some days after the excision of the superior cervical ganglion; a ganglion from which seem to arise all or nearly all the sympathetic fibres innervating the sub-maxillary gland.

But the comparison cannot be made between the effects observed in the cat after section of the sciatic or the nerves of the brachial plexus on the sweat glands of the digital pulps of that animal, and those that section of the secretory nerves produces on the function of the salivary glands in dogs, unless we cut in the latter case, in the same animal, the chorda tympani and the sympathetic secretory fibres.

This experiment was performed on three dogs:

In one of them the lingual and sympathetic of the right side were cut on the 30th of April, 1878. On the 8th of May a little infusion of jaborandi was injected, towards the heart, in one of the sapheni veins. Some instants later the saliva began to flow from the duct of Wharton drop by drop, the flow lasting several minutes, then slackening, but revived again by another injection. (Wharton's duct was prepared only on the side of the cut nerves.)

In a second dog the section of the two nerves was made on the 19th of June, 1878. On the 3d of July we injected into one of the saphenous veins a small quantity of infusion of jaborandi. Almost at once the saliva began to flow from Wharton's ducts on both sides, but more abundantly and rapidly on the side of the intact than on that of the divided nerves.

In a third dog, the lingual joined to the chorda tympani was divided, on the right side on July 5th, 1878, and on the same day the superior cervical ganglion was completely excised. On July 18th some cubic centimetres of jaborandi infusion were injected towards the heart, into one of the saphenous veins. As in the former experiments a flow of saliva from both ducts of Wharton, more abundant and appearing more quickly on the left (nerves intact) side than on the right.

Having sufficiently verified these results, it is yet needful, before concluding, to assure ourselves that the sub-maxillary salivary glands do not receive other secretory nerve fibres than those derived from the chorda tympani and the superior portion of the cervical sympathetic. To ascertain the facts as to this I faradized energetically the superior extremity of one of the sciatic nerves, in a dog that had undergone, ten days previously, the section of the chorda tympani and the excision of the superior cervical ganglion on the right side. Under the influence of this excitation an abundant flow of saliva was produced from Wharton's duct on the left side, while not a single drop flowed from the tube in the duct of the opposite side.

It follows, therefore, from these experiments, that section of the excito-secretory nerves of the sub-maxillary salivary gland does not exert such an influence on the function of the gland, as does the section of the sciatic over the sudoriparous glands of the digital pulps of the posterior limb. Jaborandi still acts on the sub-maxillary gland many days after the section of the excito-salivary nerves, while it or its alkaloid, pilocarpine, from the sixth day after the section of the sciatic (the nerve that appears to contain all the sweat exciting fibres for the hind limb), has no more action on the sudoriparous glands of the corresponding member.

What is the cause of such dissimilarity of the results of two experiments that offer at first sight so great a resemblance? Is it due solely to the difference of constitution of the substance of the proper anatomical elements of the two kinds of glands, sudoriparous and salivary? Shall we seek the reason in the circulatory modifications produced under the influence of the section of the nerves, which modify differently the functions of the simple glands (sweat glands) from those of the composite glands (sub-maxillary)? or rather, shall we not attribute this dissimilarity to the enormous quantity of nerve cells distributed, either singly or in more or less voluminous ganglionary groups over the whole length of the secretory nerves destined for the sub-maxillary gland, cells which, after the division of these nerves apparently prevent the fibres from gradually losing their excitability to their peripheral terminations?

The latter explanation seems most satisfactory, but new researches are needed to definitely establish its value.

THE INFLUENCE OF THE QUANTITY OF BLOOD IN THE MUSCLES ON THEIR IRRITABILITY.—The following is the *resumé* of a note by M. Schmoulewitsch to the Acad. des Sciences, Paris, in September last, as given in the *Bulletin Générale de Thérapeutique:*

The experiment of Stevson, dating from the seventeenth century, and which consists in producing a paralysis of the posterior members by a ligature of the abdominal aorta, proves the intimate relation between the circulation of blood in the muscles and their function. M. Brown-Séquard has shown that in animals and even in man, the stiffened muscles recover their contractility after injection of arterial blood. It may be admitted in a general way that bloodless muscles lose their irritability and cease to perform their functions.

In repeating these experiments, I have found that the muscles in becoming anæmic do not at once lose their irritability. On the contrary, this for a while is even increased, and only commences to disappear after a certain degree of augmentation. The same phenomenon is observed after section of a nerve, the irritability of the corresponding muscle is increased for